

RESOURCE SIGNALING FOR PUCCH**CROSS-REFERENCE TO RELATED APPLICATION**

This application is a continuation of International Application No. PCT/SE2017/050134, filed Feb. 13, 2017, the entirety of which is incorporated herein by reference.

TECHNICAL FIELD

This disclosure pertains to wireless communication technology, in particular in the context of Radio Access Technology/Networks (RAT/RAN).

BACKGROUND

New wireless communication technologies, e.g. 5G technologies like 3GPP New Radio, are being developed and introduced for a wide range of use cases. To cover this wide range, more flexibility for signaling is desirable, in particular for control signaling.

SUMMARY

It is an object of the present disclosure to provide approaches allowing flexible transmission of uplink control signaling, respectively acknowledgement signaling. In the context of this disclosure, acknowledgement signaling may be considered a form of uplink control signaling, and/or be included and/or implemented therein, or be separately implemented. For example, uplink control signaling may comprise acknowledgement signaling next to for example scheduling grants and/or measurement reporting. Alternatively, acknowledgement signaling may be implemented to only comprise acknowledgement information, at per individual message.

Accordingly, there is disclosed a user equipment, UE, for a Radio Access Network. The UE is adapted for transmitting acknowledgement signaling pertaining to downlink data. The downlink data comprises one or more downlink data elements. The acknowledgement signaling has an uplink signaling format comprising one or more acknowledgement substructures, wherein each of the substructures carry acknowledgement information pertaining to a downlink data element. Further, each of the acknowledgement substructures is mapped to a different of the downlink data elements based on at least one acknowledgement position indication provided in downlink control signaling received by the UE. The UE may comprise processing circuitry and/or radio circuitry, in particular a transmitter or transceiver, and/or be adapted to use such, for transmitting acknowledgement signaling. Alternatively or additionally, the UE may comprise a transmitting module for such transmitting. It may be considered that the UE comprises a receiver, and/or a receiving module, for receiving downlink data and/or downlink control signaling, e.g. from a network node.

A method of operating a user Equipment, UE, in a Radio Access Network is also proposed. The method comprises transmitting acknowledgement signaling pertaining to downlink data, the downlink data comprising one or more downlink data elements. The acknowledgement signaling has an uplink signaling format comprising one or more acknowledgement substructures, each of the substructures carrying acknowledgement information pertaining to a downlink data element. Further, each of the acknowledgement substructures is mapped to a different of the downlink

data elements based on at least one acknowledgement position indication provided in downlink control signaling received by the UE. The method may comprise receiving downlink data and/or downlink control signaling, e.g. from a network node.

Moreover, a network node for a Radio Access Network may be considered. The network node is adapted for transmitting downlink control signaling comprising an acknowledgement position indication. The acknowledgement position indication indicates a mapping of at least one acknowledgement substructure of an uplink signaling format comprising one or more acknowledgement substructures to a corresponding data element of downlink data, wherein the acknowledgement substructure is mapped for carrying acknowledgement information pertaining to the downlink data element. The network node may comprise processing circuitry and/or radio circuitry, in particular a transmitter or transceiver, and/or be adapted to use such, for transmitting acknowledgement signaling. Alternatively or additionally, the network node may comprise a transmitting module for such transmitting.

In addition, there is described a method of operating a network node in a Radio Access Network. The method comprises transmitting downlink control signaling comprising an acknowledgement position indication. The acknowledgement position indication indicates a mapping of at least one acknowledgement substructure of an uplink signaling format comprising one or more acknowledgement substructures to a corresponding data element of downlink data, wherein the acknowledgement substructure is mapped for carrying acknowledgement information pertaining to the downlink data element.

Transmitting downlink control signaling may be transmitting to one or more than one UEs. It may generally be considered that transmitting downlink control signaling is an example and/or part of configuring the UE/s, in particular configuring on the physical layer and/or dynamic configuring.

Alternatively, there may be considered a network node for a RAN, the network node being adapted for receiving acknowledgement signaling having an uplink signaling format as discussed herein. The network node may in some variant be implemented as network node adapted for transmitting downlink control signaling as described herein. Independently, there may be considered a method of operating a network node in a RAN, the method comprising receiving acknowledgement signaling having an uplink signaling format as discussed herein. The method may comprise transmitting downlink control signaling as described herein, in particular before receiving, and/or for configuring, the acknowledgement signaling respectively the format. Receiving acknowledgement signaling may be based on a corresponding configuration, which may be known to the network node, which may determine it itself (for configuring the UE), and/or may have received corresponding information from another network node and/or the UE. The network node may comprise and/or utilize a receiver and/or a receiving module for such receiving.

The proposed approaches allow flexible signaling to a UE of which substructure, e.g. of a resource, for use for acknowledgement signaling. Thus, acknowledgement signaling may be adapted to a wide range of uses and situations, ensuring reliable information. It should be noted that in the context of this disclosure, a single acknowledgement substructure in an uplink signaling format mapped to one data element is considered to represent each of the acknowledgement substructures of the format being mapped to a different